

30V(D-S) N-Channel Enhancement Mode Power MOS FET

General Features

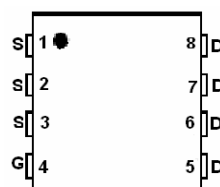
- $V_{DS}=30V, I_D=25A$
 $R_{DS(ON)} < 10m\Omega @ V_{GS}=10V$
 $R_{DS(ON)} < 14m\Omega @ V_{GS}=4.5V$
- High density cell design for ultra low R_{dson}
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation
- Special process technology for high ESD capability



Lead Free

Application

- SMPS and general purpose applications
- Hard switched and high frequency circuits
- Uninterruptible power supply

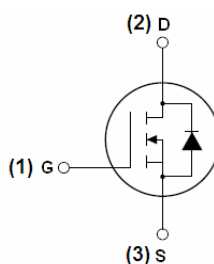


Marking and pin Assignment

PIN Configuration



DFN 3x3 EP top view



Schematic diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
MSN0325R	MSN0325R	DFN 3x3 EP	-	-	-

Absolute Maximum Ratings ($T_C=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	30	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	25	A
Drain Current-Continuous($T_C=100^\circ\text{C}$)	$I_D(100^\circ\text{C})$	17	A
Pulsed Drain Current	I_{DM}	50	A
Maximum Power Dissipation	P_D	25	W
Derating factor		0.2	W/ $^\circ\text{C}$
Single pulse avalanche energy (Note 5)	E_{AS}	70	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^\circ\text{C}$

Thermal Characteristic

Thermal Resistance, Junction-to-Case ^(Note 2)	$R_{\theta JC}$	5	$^{\circ}\text{C/W}$
--	-----------------	---	----------------------

Electrical Characteristics ($T_C=25^{\circ}\text{C}$ unless otherwise noted)

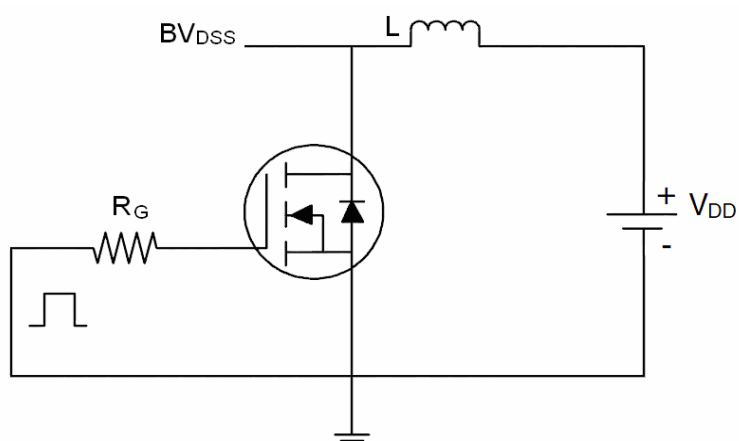
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	30	33	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =30V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics ^(Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	1	1.6	3	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =10A	-	7.0	10	mΩ
		V _{GS} =4.5V, I _D =10A	-	10.5	14	
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =20A	15	-	-	S
Dynamic Characteristics ^(Note4)						
Input Capacitance	C _{iss}	V _{DS} =15V, V _{GS} =0V, F=1.0MHz	-	1530	-	PF
Output Capacitance	C _{oss}		-	250	-	PF
Reverse Transfer Capacitance	C _{rss}		-	198	-	PF
Switching Characteristics ^(Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =15V, I _D =10A V _{GS} =10V, R _{GEN} =1.8Ω	-	10	-	nS
Turn-on Rise Time	t _r		-	8	-	nS
Turn-Off Delay Time	t _{d(off)}		-	30	-	nS
Turn-Off Fall Time	t _f		-	5	-	nS
Total Gate Charge	Q _g	V _{DS} =15V, I _D =9A, V _{GS} =10V	-	15	-	nC
Gate-Source Charge	Q _{gs}		-	3	-	nC
Gate-Drain Charge	Q _{gd}		-	4.5	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage ^(Note 3)	V _{SD}	V _{GS} =0V, I _S =10A	-	0.85	1.2	V
Diode Forward Current ^(Note 2)	I _S		-	-	25	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = 10A di/dt = 100A/μs(Note3)	-	22	35	nS
Reverse Recovery Charge	Q _{rr}		-	12	20	nC
Forward Turn-On Time	t _{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

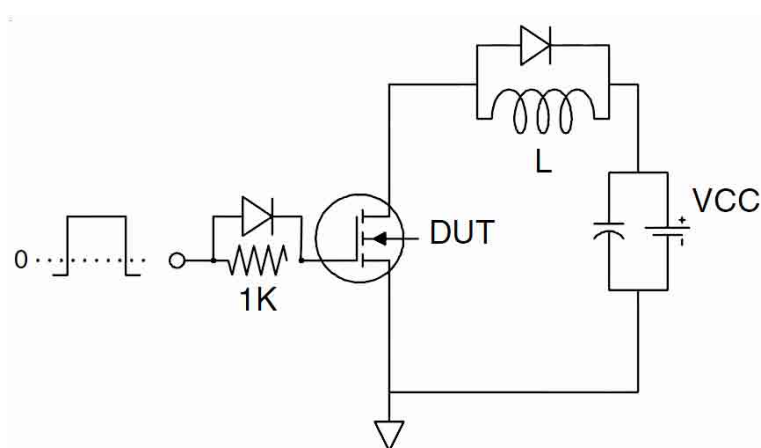
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production
5. EAS condition: $T_J=25^{\circ}\text{C}, V_{DD}=15V, V_G=10V, L=0.1mH, R_g=25\Omega$

Test Circuit

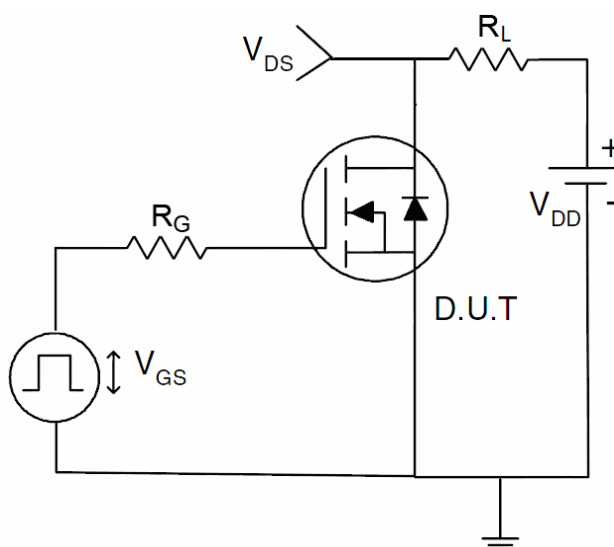
1) E_{AS} Test Circuit



2) Gate Charge Test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

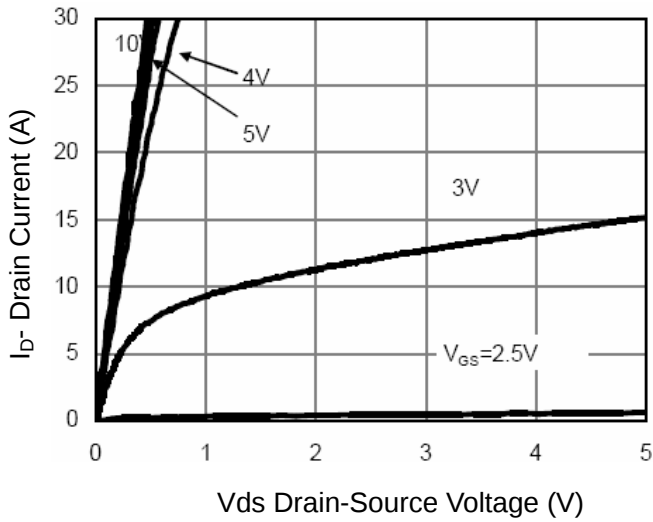


Figure 1 Output Characteristics

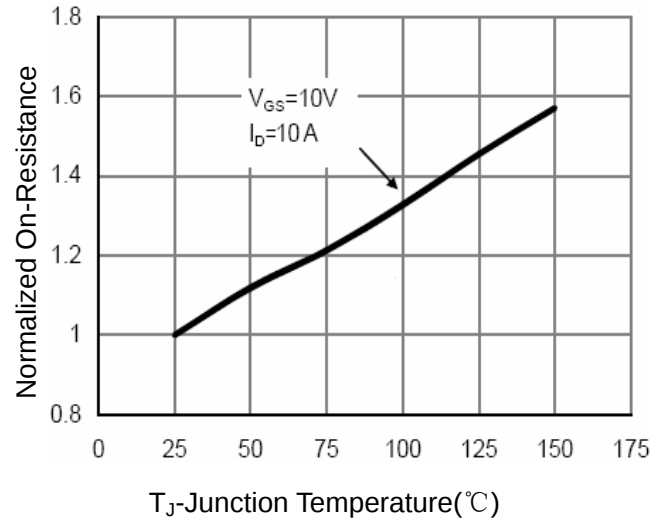


Figure 4 Rdson-Junction Temperature

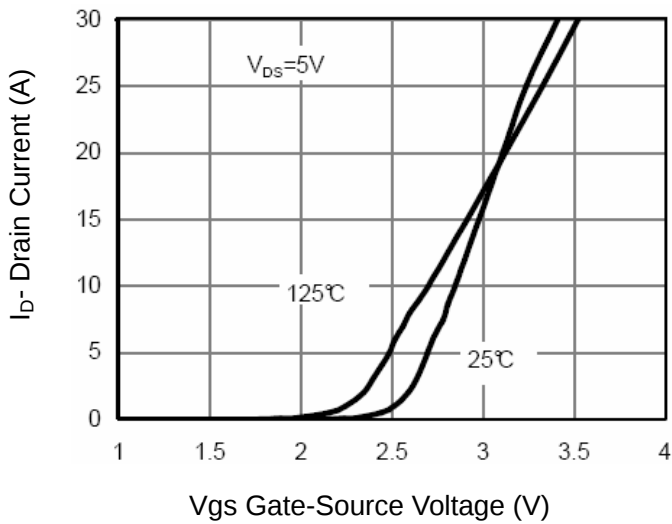


Figure 2 Transfer Characteristics

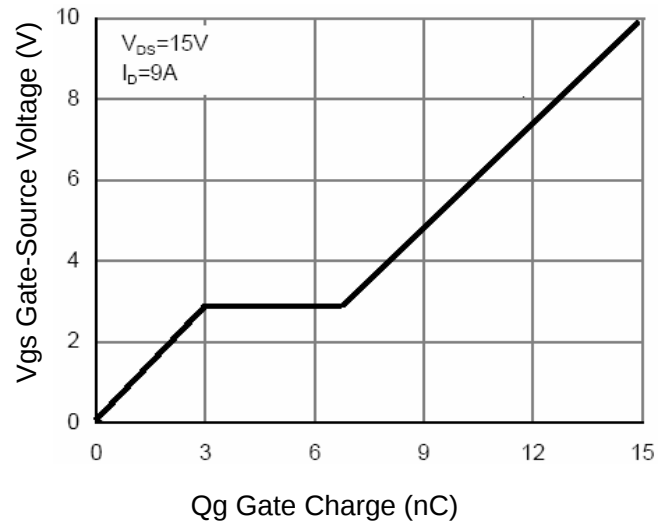


Figure 5 Gate Charge

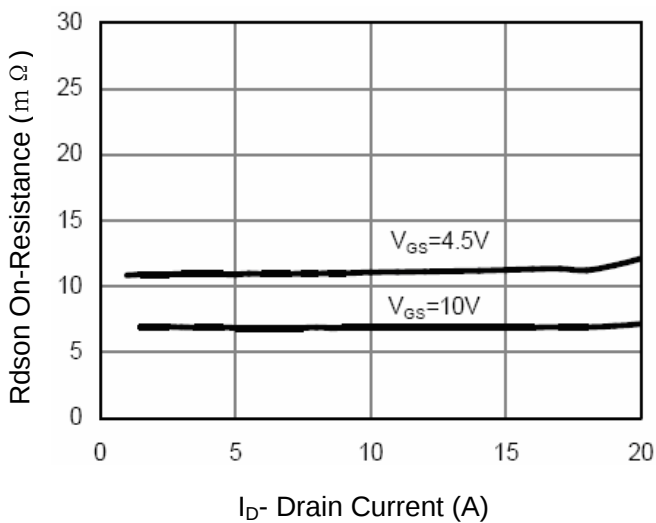


Figure 3 Rdson- Drain Current

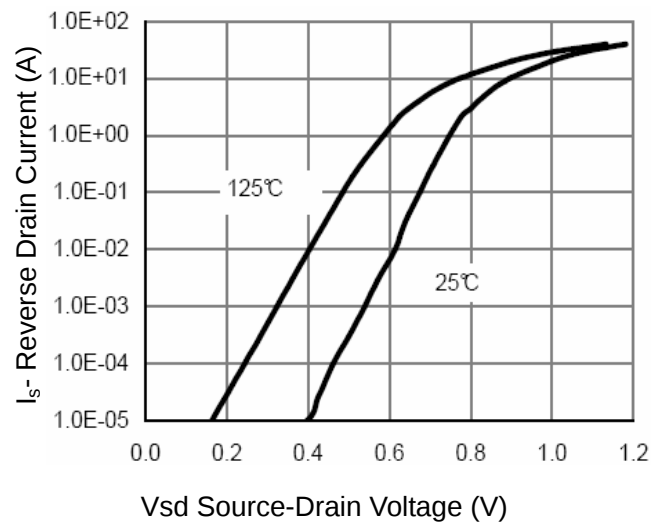
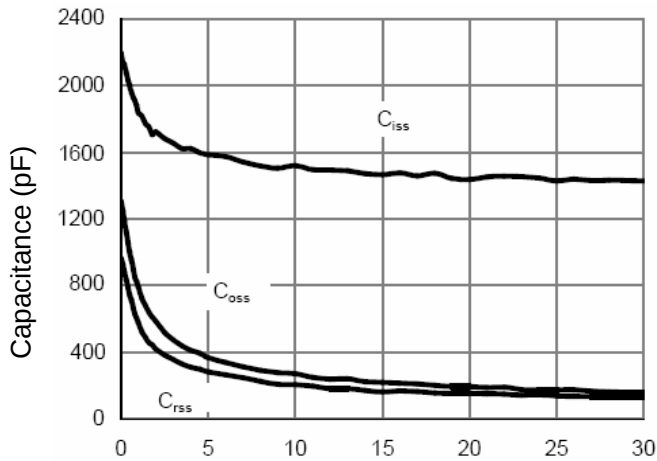
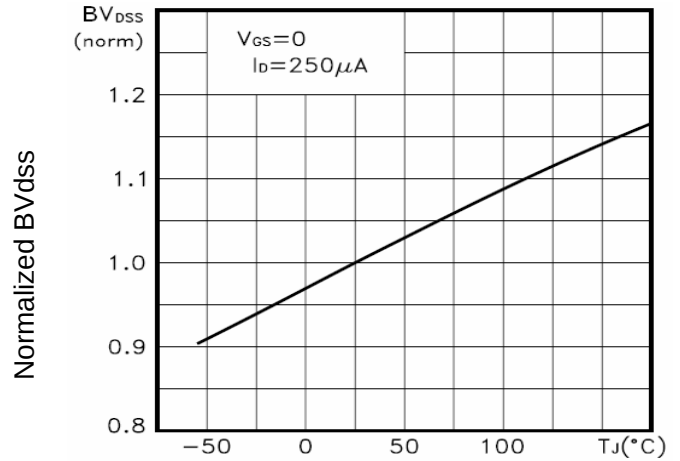


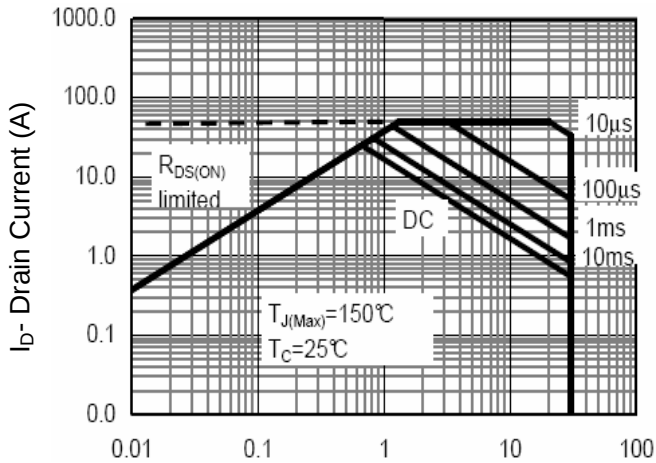
Figure 6 Source- Drain Diode Forward



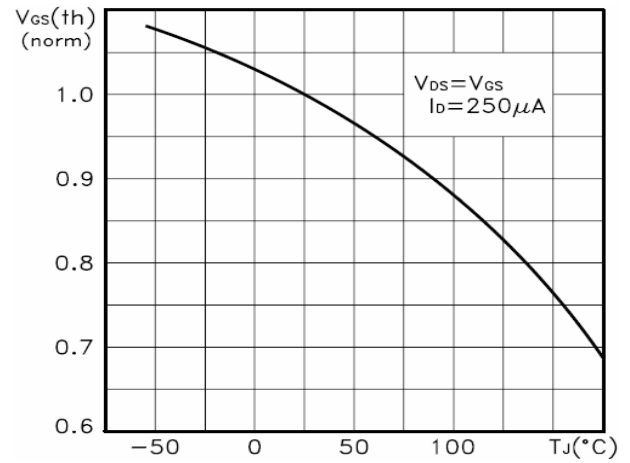
Vds Drain-Source Voltage (V)
Figure 7 Capacitance vs Vds



TJ-Junction Temperature(°C)
Figure 9 BV_{DSS} vs Junction Temperature



Vds Drain-Source Voltage (V)
Figure 8 Safe Operation Area



TJ-Junction Temperature(°C)
Figure 10 V_{GS(th)} vs Junction Temperature

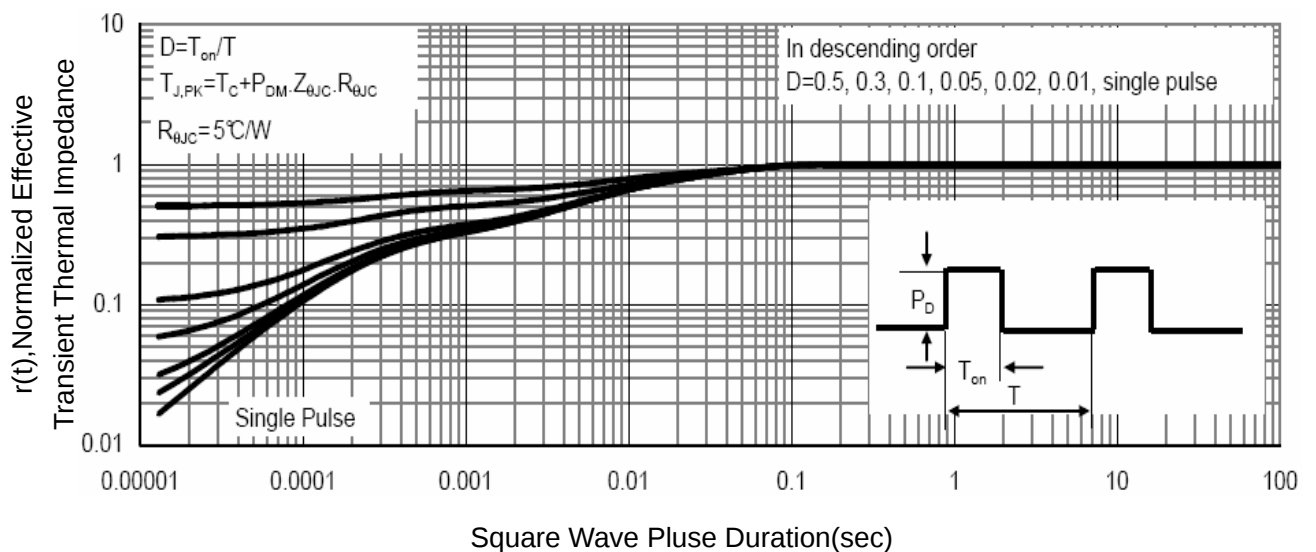
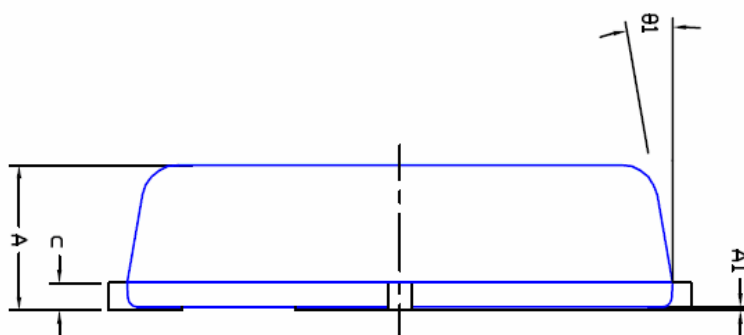
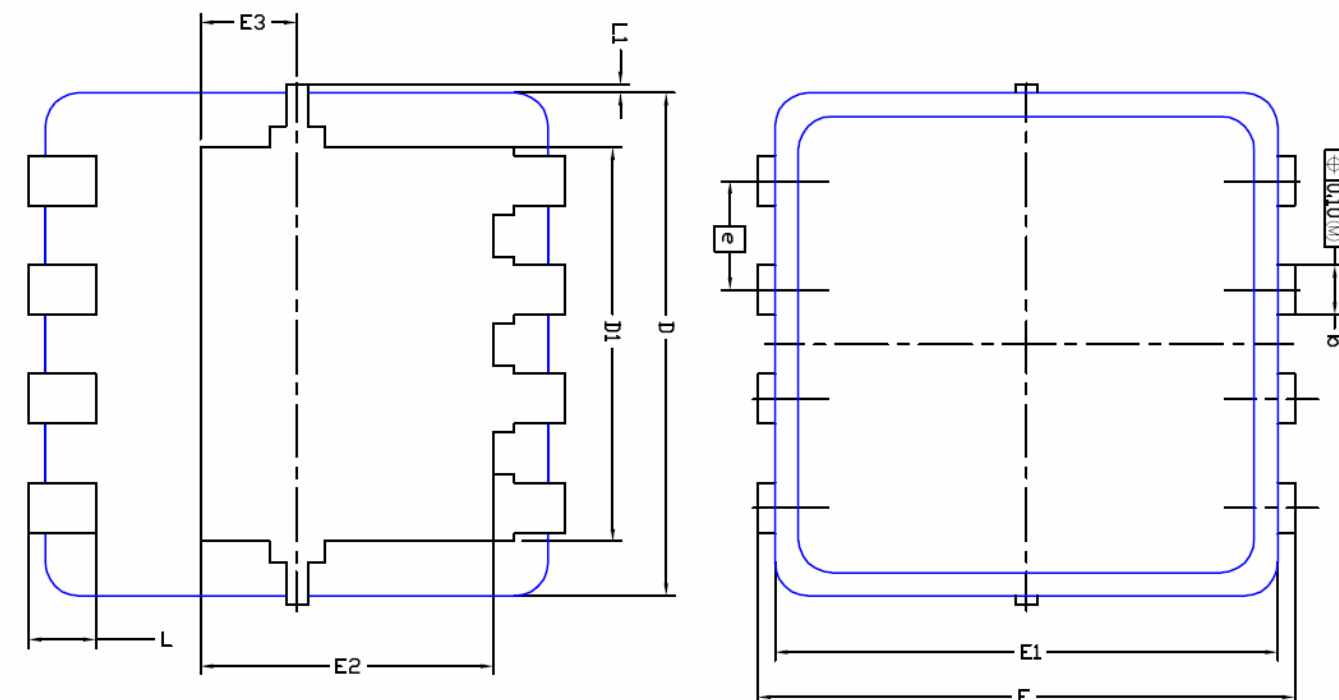


Figure 11 Normalized Maximum Transient Thermal Impedance

DFN3X3 EP Package Information



DIM.	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.700	0.80	0.900	0.0276	0.0315	0.0354
A1	0.00	---	0.05	0.000	---	0.002
b	0.24	0.30	0.35	0.009	0.012	0.014
c	0.10	0.152	0.25	0.004	0.006	0.010
D	3.00 BSC			0.118 BSC		
D1	2.35 BSC			0.093 BSC		
E	3.20 BSC			0.126 BSC		
E1	3.00 BSC			0.118 BSC		
E2	1.75 BSC			0.069 BSC		
E3	0.575 BSC			0.023 BSC		
e	0.65 BSC			0.026 BSC		
L	0.30	0.40	0.50	0.0118	0.0157	0.0197
L1	0	---	0.100	0	---	0.004
θ1	0°	10°	12°	0°	10°	12°